Practical Paths of Green Finance Supporting Agricultural Development

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Abstract. Under the backdrop of the dual carbon goals and the rural revitalization strategy, the green transformation of agriculture has become an inevitable choice for achieving the synergy of ecological, economic and social benefits. However, the transformation is confronted with core obstacles such as high costs and difficult financing. This study focuses on the practical paths of green finance supporting agricultural development, aiming to enrich the research in related niche fields and provide references for practice. The study constructs a three-dimensional core path of "product matching demand, precise coverage of subjects, and ecological synergy empowerment", through product innovations such as differentiated innovation of green credit, expansion of direct financing tools, and integration of carbon sink value, to precisely empower different operating subjects, and rely on multi-party collaboration to build a support system. At the same time, it proposes coordinated guarantee measures such as policy support, risk control, and infrastructure construction. This paper provides a reference for the practice of green finance in the agricultural field.

Keywords: Green Finance, Green Agricultural Development, Practical Paths, Financing Support, Carbon Sinks.

1 Introduction

Under the backdrop of the dual carbon goals and the rural revitalization strategy, emission reduction, carbon sequestration, and improvement of quality and income drive the development of Chinese agriculture. Achieving the coordinated development of ecological, economic and social benefits in rural areas through the green transformation of agriculture has become an inevitable path. Compared with traditional agriculture, which has high pollution, excessive water consumption and low economic benefits, green agriculture, through organic farming, biological control, drip irrigation instead of flood irrigation, and the use of green energy, can not only reduce pollution and carbon emissions, but also enhance economic benefits by relying on high-quality organic agricultural products to achieve a win-win situation of ecological and economic benefits [1,2]. Although the green transformation of agriculture in China has been advancing steadily, the efficiency of popularizing green technologies and efficient equipment is insufficient. In the small-scale farming model, the iteration of tools is slow, and the shortage of funds has become the core bottleneck. Green finance, through capital aggregation

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and technology empowerment, breaks this predicament and can significantly promote the synergy of pollution reduction and carbon sequestration in agriculture, promote the large-scale application of green production tools, and also improve agricultural ecological efficiency through optimizing resource allocation [3].

This study focuses on the practical paths of green finance supporting agricultural development, aiming to enrich the research results of green finance in the agricultural sub-sectors, further improve the relevant theories of the financial support system under the dual carbon goals and rural revitalization strategy, and at the same time provide practical and feasible financing channel reference for government to formulate targeted green finance support policies, financial institutions to innovate directions, and for agricultural business entities to further develop green agriculture.

2 Foundations and Current Status of Green Finance Supporting Agricultural Development

2.1 Demand and Pain Points of Agricultural Green Development

The transformation of traditional agriculture to green agriculture is an inevitable path for achieving sustainable agricultural development. However, it faces significant cost pressures and financing difficulties, which have become a major pain point restricting the transformation. Moreover, different entities encounter different transformation challenges. Green agricultural projects in China and globally share the common characteristics of large initial investment and long return cycles. Coupled with various financing difficulties, these have created transformation challenges.

The high prices of green production materials, large investment in technological transformation, the need to attract high-tech talents, and meeting compliance standards have all contributed to the high-cost pressure of the green agricultural transformation. For instance, the infrastructure project of the ecological organic tea valley in Shanyang, Zhejiang Province, had a funding gap of 510,000 yuan for only the partial supporting works, and needed to rely on government financial subsidies to fill the gap. The smart greenhouse project in Miyun District, Beijing, initially faced a 10-million-yuan construction funding gap due to the lack of collateral, nearly causing the project to be halted. In France, the funding gap for organic agriculture and mountain agriculture reached 853 million euros, highlighting the global universality of cost and financing issues.

The difficulties in financing have further exacerbated the cost pressure. Financing constraints have a significant negative impact on the adoption of green agricultural technologies, with small and medium-sized business entities being the most affected [4]. Green agricultural projects generally face problems such as high financing difficulty, high financing costs, and a mismatch between loan cycle and transformation cycle. Due to improper capital allocation, there is a funding gap for agricultural ecological transformation, and many small farmers find it difficult to bear the transformation costs due to financing exclusion.

Furthermore, the transformation challenges faced by different entities vary. Small farmers face the dual challenges of lacking collateral and insufficient technology; new agricultural business entities are constrained by long-term financing gaps; regional industries have insufficient infrastructure support funds.

In conclusion, the high transformation costs and severe financing difficulties are intertwined, becoming the core pain points hindering the transformation of traditional agriculture to green agriculture. Solving these two major problems is the key prerequisite for promoting the green and sustainable development of agriculture.

2.2 Existing Practices of Green Finance Supporting Agricultural Development

Green finance supports agricultural green development through the synergy of policies and markets. At the policy level, China has constructed a supporting system through a combination of policies such as green credit interest subsidies, special subsidies, and tax incentives, leveraging the synergy of finance and the government to mobilize financing funds and guide capital aggregation. Relevant studies have quantitatively verified its positive impact, with interest rate subsidies and guarantee applications being widely used, and tax incentives reducing the participation cost [5,6].

At the market level, various green financial tools have been implemented and achieved results. Green credit, as the core tool, is widely applied in areas such as ecological planting and circular agriculture. As of the end of 2023, the balance of green loans of the Agricultural Development Bank of China exceeded 2.3 trillion yuan, and its promoting effect on the total factor productivity of agricultural greenness has been verified; green bonds connect the capital market with green agriculture, and after 2021, they were included in the investment direction of ecological agriculture, solving the mismatch of financing factors through information disclosure [7-9].

The practice in Huzhou, Zhejiang Province is of considerable demonstration significance. Relying on the "carbon efficiency code + green credit + interest subsidy" model for precise empowerment, Huzhou Bank has launched characteristic products such as "White Tea Loan" and has cumulatively issued agricultural green loans exceeding 4 billion yuan, providing replicable examples for other regions [10].

3 Core Practical Paths of Green Finance Supporting Agricultural Development

Green finance to support agricultural development needs to establish a three-dimensional path of 'product matching with demand, precise coverage of entities, and ecological synergy for empowerment', with these three elements interdependent and mutually reinforcing.

3.1 Product Innovation Path to Adapt to the Needs of Agricultural Green Development

Green financial product innovation supports agricultural green development by optimizing green credit products, expanding green direct financing tools, and integrating carbon sink value, etc.

Providing differentiated financial support for different agricultural green projects is an important direction for the optimization of green credit. For every 1% increase in green credit, it can drive a 0.482% growth in local Gross Domestic Product (GDP) and has a significant positive impact on agricultural green projects [11]. Therefore, reducing the risks of financial institutions in granting green credit and increasing farmers' willingness to apply for loans has become a major issue. For different agricultural scenarios such as planting, breeding, and agricultural product processing, financial institutions can launch corresponding special credit products. These special credit products have prominent risk control advantages; after entering the market, they increase the willingness of financial institutions and farmers to use them by virtue of a lower default rate than traditional credit, maintaining their sustainability.

To broaden the sources of funds for agricultural green development, the expansion of direct financing tools is crucial. Green bonds, as an important financial tool, have seen a global issuance volume increase from 100 billion US dollars in 2015 to 800 billion US dollars in 2024. Agricultural-related projects have achieved a million-ton-level CO_2 emission reduction effect [12]. Green funds also play a key role, with the global scale of agricultural green funds reaching 120 billion US dollars in 2022. Its return on investment is 2.3% higher than traditional agricultural investment, and 65% of the funds are invested in small and medium-sized farmers' projects, balancing efficiency and inclusiveness [13].

In recent years, with the popularity of global carbon topics, the innovation of green finance combined with carbon sinks has become a notable new growth point. Agricultural carbon sinks have huge potential to provide an innovative foundation for green finance. It is expected that by 2050, the cumulative carbon emission reduction potential of agricultural carbon sinks will be comparable to afforestation, bringing up to 375 billion US dollars in economic value to global producers [14]. This not only brings continuous benefits to agricultural and related business entities but also forms an expected and transferable carbon sink income right asset. This clear asset attribute provides core support for financial product innovations such as pledge loans, green credit, and carbon sink forward and futures contracts. People believe that by taking carbon sinks as an example, this innovative model will integrate the ecological resource value of green agriculture into a virtuous cycle. On the one hand, it promotes the development of green finance through the value of ecological resources, and on the other hand, it provides financial support for the funds needed by green agriculture through green finance, achieving a two-way improvement of ecological and economic values.

3.2 Subject Empowerment Path to Cover the Needs of Different Participants

Empowering the main body is an important path for green finance to deeply penetrate the agricultural industry chain, effectively enhancing the precision and coverage of green financial services.

At the individual farmer level, it focuses on simplifying procedures and providing technical support. Simplifying the loan approval process will effectively help the credit funds to be implemented. By increasing the approval rate of applications and shortening the business processing time, it provides more opportunities for farmers to develop and transform and supports them to invest more quickly in production and obtain returns. At the same time, providing guidance on green agricultural technologies can enhance the farmers' sustainable production capabilities. For example, providing guidance on water-saving irrigation can reduce the risks caused by insufficient technology and improve their production efficiency, providing the ability to repay, which leads to a decrease in the default rate of green loans, reducing financial risks and facilitating the green transformation of farmers.

At the level of new agricultural business entities, it focuses on large-scale credit and full-cycle financing. Large-scale green loans can support large-scale production. After family farms and cooperatives obtain large-scale credit, the average green planting area expands by 1.8 times, and the per-plot carbon emissions decrease by 31% [13]. Full-cycle financing can solve the problem of mismatched terms. The success rate of 5-10-year green agricultural projects is 56% higher than that of 1-3-year short-term loans and is more in line with the return cycle of green agricultural transformation [12].

At the regional level, it can leverage the advantages of agricultural clusterization to concentrate financial resources and improve service efficiency and reduce costs by finding green agricultural industrial concentration areas and concentrating financial resources. Cluster operation enables financial institutions to rely on the overall credit assessment of the cluster to evaluate enterprises, solve the problems of difficult mortgage disposal and poor credit assessment of individual entities, and thereby increase the investment willingness of financial institutions in this region and reduce the financing interest rates and service fees of related enterprises within the region.

3.3 Ecological Coordination Path to Build a Multi-party Linked Support System

In the field of green finance, there are many entities involved in supporting the development of green agriculture. However, their respective operations have obvious limitations, including mismatch between capital supply and project demand, incomplete risk-sharing mechanisms, and fragmented policy implementation. Therefore, building a multi-party collaborative green finance ecosystem is an important path to address these issues.

The government, banks, and enterprises form the core chain of funds from planning to implementation. The government takes the lead in establishing a platform for the connection between green agriculture and finance, clarifying policy directions and standards. Banks rely on the platform and supply funds precisely in accordance with policies and standards, while enterprises only need to focus on project construction. By

attracting bank capital through government risk sharing and policy incentives, the financing gap for green agricultural projects can be efficiently filled. The information platform established by the government can also reduce the capital flow costs among the three entities, strengthen collaboration and efficiency, and achieve precise matching of policy guidance and market funds.

Banks, guarantee institutions, and insurance companies collaborate to provide effective support for enhancing credit and risk mitigation. Guarantee institutions provide credit guarantees for agricultural business entities, and insurance companies share the natural and market risks faced by the business entities through agricultural green insurance. The two parties collaborate to reduce banks' credit concerns and expand the scale of credit lending.

Cross-departmental collaboration is the fundamental guarantee for the smooth operation of the system. Departments such as agriculture and rural affairs, environmental protection, and financial supervision jointly issue supporting policies, unify the standards for green agricultural projects, share regulatory data, and jointly formulate incentive policies to ensure that all departments work in the same direction and provide a stable institutional environment for agricultural green development.

4 Guarantee Measures for Green Finance Supporting Agricultural Development

Policy guarantees set clear directions, risk prevention and control establish the bottom line, and infrastructure provides the foundation. These three elements form a 'direction - bottom line - foundation' collaborative guarantee system, ensuring the protection of green finance in supporting agricultural development.

4.1 Policy Guarantee

The cost of the green agricultural transformation is not only high in terms of production factors, but also the financing cost cannot be ignored. Subsidies and interest rate reduction policies for green agricultural financing can effectively reduce this cost. By constructing a model that includes interest subsidies and the reduction of the deposit reserve ratio, it has been confirmed that it can lower loan interest rates and enhance the overall efficiency of the agricultural supply chain [15]. Some studies have also proposed that through the practice of Asian countries, it shows that to promote the green transformation of agriculture and regional sustainable agricultural development, the government needs to introduce special policies that facilitate business entities' access to green credit, while encouraging international capital to invest in green agricultural projects [16].

In addition to the collaboration of banks, guarantee institutions and insurance companies provide financing support as discussed above, improving incentive policies is also based on the same principle. Through measures such as government-backed financing guarantees, implementing lower risk weights for specific loans, and issuing

special financial bonds, the risks for financial institutions to participate are reduced, and more capital investment is stimulated.

Establishing a unified standard for green agriculture covering multiple dimensions such as resource efficiency, environmental impact, and carbon emission calculation is the prerequisite for policy implementation and also the basis for financial institutions to better quantify risks. With scientific and standardized standards, it can be in line with international standards, reduce unnecessary tariff costs for green agricultural product exports, and increase the international competitiveness of green agriculture. At the same time, clarifying the scope of green financial support provides a standardized implementation range for subsidies, tax incentives, and other policies.

4.2 Risk Prevention and Control

Risk prevention and control is extremely necessary for any financial instrument or product, especially for green agriculture which is influenced by natural factors such as climate. Only with stable and efficient risk prevention and control capability can green agriculture achieve sustainable development.

A sound green finance risk assessment system should incorporate considerations of natural factors to address the risk assessment challenges brought about by the dependence of agriculture on the environment. It should rely on the International Standardized Assessment Framework of the Natural Capital Protocol and conduct quantitative analysis of the degree of agricultural dependence on ecological resources and qualitatively assess the impact of changes in natural capital on project returns, ensuring the scientific nature of the assessment [17]. The risk assessment system includes core indicators such as natural capital dependence, climate risk sensitivity, carbon reduction potential, and operational compliance. It adopts a combination of quantitative and qualitative assessment methods. For specific risk factors in different agricultural fields, they should be quantified differently as financial risk parameters to further strengthen the response capabilities for various green agricultural fields.

International experience can be drawn up to establish risk compensation funds. By setting up mutual funds to compensate for production and income losses, the proportion of public subsidies should be reasonably defined to enhance the sustainability of the fund. The fund should enable multiple parties to share risks, distributing the risks to the government, financial institutions, and farmers, thereby enhancing the overall risk response capability of the industry.

In terms of risk allocation, agricultural catastrophe bonds can be designed. Based on deviations from the means of production, contracts can be set up, and systemic risks can be allocated to a wider range of capital markets. A large number of index-based insurance products such as agricultural carbon sink index insurance can be developed, leveraging the advantages of index-based insurance to reduce operating costs and improve claim efficiency. A unified index can be set for regions or categories, eliminating the need to individually assess losses and determine compensation for each scattered small-scale farmer, which is more in line with the small-scale and decentralized opera-

tion status of agriculture in China. This can significantly lower the underwriting threshold and make insurance more widespread. The majority of risks can be ultimately shared by insurance companies.

4.3 Infrastructure

Focus on the construction of corresponding infrastructure in two major directions: information exchange and accounting standards, providing strong guarantees for green finance and also facilitating the development of green agriculture. Establishing an information sharing platform can address the information asymmetrical issue in agricultural green finance. Relying on blockchain technology to build a distributed data platform, it can achieve trustworthy storage, certification, and real-time synchronization of cross-entity data such as agricultural production, carbon sequestration, and financing, eliminate information islands and thereby improve the efficiency of financial institutions' assessment.

Improving the carbon emission accounting system and obtaining international certification is the key to standardizing the investment direction of green finance and aligning green agriculture with the world's carbon market. It is necessary to establish an MRV system adapted to agricultural characteristics, adopting standardized measurement methods integrating remote sensing and Internet of Things (IoT) technologies to achieve real-time collection of core data such as agricultural carbon sequestration and greenhouse gas fluxes, optimizing the online monitoring of agricultural carbon emissions based on different agricultural categories, and strictly implementing the third-party verification process for precise reporting and scientific verification [18]. A unified accounting and certification system can also make the evaluation of forestry and agricultural carbon sink assets more standardized, better aligning with financial products, and providing credibility guarantees for carbon sink mortgage loans and green bond issuances.

5 Conclusion

Driven by the dual goals of carbon neutrality and the rural revitalization strategy, the green transformation of agriculture is the key to resolving the problems of high pollution and low efficiency in traditional agriculture. However, the high transformation costs and severe financing constraints have become the core pain points, leaving small farmers facing a double gap in funds and technology, and new agricultural business entities suffering from long-term financing difficulties. Regional industries are also limited by insufficient infrastructure funding. Currently, green finance has formed a preliminary support system through policy and market collaboration. At the policy level, combined policies such as interest subsidies and subsidies are used to drive capital aggregation. At the market level, green loans, bonds, and other tools have been implemented and achieved results. The "carbon effect code + green loans + interest subsidies" model in Huzhou, Zhejiang Province provides a replicable example.

To systematically solve the above problems, this study proposes a three-dimensional practical path of "product adaptation to demand, precise coverage of entities, and ecological collaborative empowerment": The product end expands financing channels by means of differentiated credit, expanding direct financing, and integrating carbon sink value; The entity end provides precise empowerment for farmers, new business entities, and regional clusters; The ecological end builds a multi-party linkage mechanism involving the government, banks, enterprises, and guarantee institutions. At the same time, policy guarantees should be clear in terms of orientation, risk prevention should be strengthened as the bottom line, and infrastructure should be solidified as the foundation. Measures such as unified standards, scientific assessment, and information sharing should be taken to ensure the implementation of the path.

This study still has certain limitations. Firstly, this study lacks quantitative comparisons of the adaptability of green finance in different regions and different agricultural categories. Secondly, the granularity of carbon sink value accounting and risk assessment indicators is insufficient, and practical verification needs to be strengthened. In the future, quantitative research should be further conducted, and core indicators such as carbon sink accounting and risk assessment should be refined. Combined with technologies such as blockchain and the Internet of Things, information sharing and precise empowerment mechanisms should be optimized. Relevant authorities and enterprises should further strengthen international cooperation, promote the alignment of agricultural carbon sink accounting standards with international standards, expand international financing channels for green agriculture, and help achieve higher-quality and more sustainable development of agricultural green transformation.

References

1. Cui, W., Jiao, W., Min, Q., Wu, M., Sun, Y.: Environmental Impact Assessment of Traditional Agricultural Systems Based on Carbon Footprint: A Case Study of Qingtian Rice-Fish Coexistence System. Acta Ecologica Sinica **40**(13), 4362-4370 (2020)
2. Wu, Z., Zhou, L., Yang, X., Gao, D., Zhan, B.: Evaluation and Path Research on the Development and Application Conditions of Low-Carbon Agricultural Technologies under the 'Carbon Neutrality' Goal. Journal of Southwest University (Natural Science Edition) **46**(07), 71-83 (2024)
3. Kong, F., Zhang, Y., Xu, C., Zhai, J.: The Impact Effect and Mechanism of Green Finance Development on the Synergistic Enhancement of Pollution Reduction and Carbon Mitigation in Agriculture. Rural Finance Research (12), 18-32 (2025)
4. Qian, H., Wen, C., Liu, Q.: Financing Constraints, Green Subsidies and Adoption of Green Production Technologies by Family Farms. Zhejiang Journal of Agricultural Sciences **37**(01), 231-244 (2025)
5. Pan, F., Zhang, C., C., Cui, N.: Research on the Impact and Mechanism of Green Finance on Agricultural Green Development. Agricultural Economics and Management (01), 42-55 (2024)
6. Pang, J., Hu, Y., Jin, S.: Financial Support for Agricultural Green Development: Opportunities, Scenarios and Policy Demands. Rural Finance Research (07), 22-28 (2022)

7. The Green Finance Research Group of the Agricultural Development Bank of China, Xu, H.: Constructing the Green Finance System of Agricultural Policy Banks. China Banking Industry (06), 10-13 (2024)
8. Chu, L., Cheng, L., Gao, Y., Deng, H., Wang, Q., Luo, Y.: Influence of green finance on agricultural green total factor productivity: a case study in China. Frontiers in Environmental Science **12**, 1463833 (2024)
9. Wei, Y.: Research on the Development of China's Green Bond Market and International Comparison. Bonds (06), 76-80 (2025)
10. Wang, X., Yan, L.: Research on Green Finance Practices of Small and Medium-sized Banks – Taking Huzhou Bank as an Example. Heilongjiang Finance (09), 42-45 (2023)
11. Chen, C., Zhong, S., Zhang, Y., Bai, Y.: The economic impact of green credit: from the perspective of industrial structure and green total factor productivity. Sustainability **15**(2), 1224 (2023)
12. Yan, Y.: Green finance as a catalyst for sustainable development: exploring the role of green bonds and impact investment in advancing environmental goals. Journal of Fintech and Business Analysis **2**(2), 27-31 (2025)
13. Das, P. K., Cungu, A.: Green finance as a critical lever for delivering sustainable agrifood systems–A global landscape study. FAO (2023)
14. Frank, S., Lessa Derci Augustynczik, A., Havlík, P., Boere, E., Ermolieva, T., Fricko, O, Wögerer, M.: Enhanced agricultural carbon sinks provide benefits for farmers and the climate. Nature Food **5**(9), 742-753 (2024)
15. Deng, L., Xu, W., Luo, J.: Optimal loan pricing for agricultural supply chains from a green credit perspective. Sustainability **13**(22), 12365 (2021)
16. Tran, T. D. P., Van, N. N., Thi, D.: The impact of green finance, natural resources and institutional quality on sustainable agriculture: evidence from Asian countries. Cogent Food & Agriculture **11**(1), 2488112 (2025)
17. Ascui, F., Cojoianu, T. F.: Implementing natural capital credit risk assessment in agricultural lending. Business Strategy and the Environment **28**(6), 1234-1249 (2019)
18. Schulte Moore, L., Jordahl, J.: Carbon science for carbon markets: Emerging opportunities in Iowa. Iowa State University (2022)

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